Effect of Drug Therapy Monitoring on the Results Associated to the Pharmacotherapy of Patients

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Keywords: Community Pharmacy, Drug Related Problems, Drug Therapy Monitoring, Negative Results Associated to Medicines, Pharmaceutical Care, Therapeutic Compliance

ABSTRACT

Objective: In this study, the effect of the support of community pharmacists to patients is carefully analyzed in terms of results of the pharmacotherapy. Setting: A community pharmacy of Granada (Spain).

Method: The Dáder program was followed to monitor the pharmacotherapy of patients. The medicines were monitored considering all their requirements (necessity, efficacy, and safety). Patient’s compliance of the pharmacotherapy was continuously controlled, and the concordance between the prescription and compliance with guidelines of drugs was always checked. The instruments that could further confirm the positive effects of the drug therapy monitoring service were the determination of the blood pressure, the body mass index, and the glucose blood levels. Additionally, several health education activities of the patients were developed, e.g., basic aspects on their chronic diseases, correct use of their medicines and, diet and hygiene recommendations. This methodology can be easily generalized outside of the context of Spain, and applied in any community pharmacy and hospital.

Main outcome measure: We focussed our attention on the drug related problems of patients that could induce unwanted results associated to medicines and a very significant decline in their quality of life. The drug related problems were classified according to the pharmacotherapy qualities of necessity, efficacy, and security.

Results: It was observed that non-compliance with the pharmacotherapy was the problem of highest frequency. Compared to the direct cooperation between the pharmacist and the patients to solve their drug related problems, the interventions done (actions taken) by the pharmacist in collaboration with the physician resulted in significantly better pharmacotherapy results.

Conclusion: This study stresses the value of the active involvement of community pharmacists to ensure the best results of the drug therapy in patients, thus leading to an enhanced quality of life.
INTRODUCTION

Pharmacotherapy has become the most important approach to increase the quality of life, and the life expectancy of humankind. Since 1970, the number of medicines commercially available has exponentially increased, and very promising pharmacological investigations have opened new routes to treat severe diseases. Despite of recent advances in pharmacotherapy, chronic diseases with important prevalence and morbidity are still on the edge of the most important health problems. For instance, diabetes and hypertension are one of the main risk factors of mortality, and inability in the population [1-3]. Additionally, important costs are associated to the assistance of patients that suffer from their complications (e.g., cardiovascular problems, ictus, or renal problems) [4, 5].

Several efforts have been focused on the definition of the best detection, control, and monitoring processes for chronic diseases. The most important problems to overcome are related to the very small percentage of patients adequately controlled, the poor treatment compliance, and the poor monitoring of the pharmacological effects. As an example, ≈ 50 % of patients suffering from chronic diseases and diagnosed by the physician do not come back for monitoring [2, 6, 7]. In the case of hypertension, it has been determined that ≥ 35 % of patients with high blood pressure levels are not adequately controlled [8, 9]. Furthermore, the insidious and furtive beginning of diabetes mellitus type II determine that ≈ 30 % of the diagnostics are done only after the complications begins. Several studies have revealed that up to ≈ 50 % of diabetics do not know that they are suffering from this illness [10, 11].

Thus, the magnitude of the problem and its impact in the health clearly claim the need for strategies of prevention and drug therapy monitoring directed to patients. Any given patient suffering from a chronic disease must receive the best health care. In this way, community pharmacists are in an excellent position to supply an integral care to the patient (i.e., screening, monitoring, and education) [5, 9-19]. Furthermore, their multidisciplinary collaboration with the rest of healthcare professionals, particularly the physicians, will dramatically contribute to the enhancement of patient’s health [13, 17, 19-22].

This work is focused on the prevention, detection, and resolution of drug related problems (DRPs) that could generate negative results associated to medicines (NRM). The Dáder program [23, 24] was used to monitor patient’s pharmacotherapy at a community pharmacy. We have analyzed and classified the DRPs that were detected, in order to clarify the best strategy to solve them. It was investigated if drug therapy monitoring of patients could very significantly contribute to an efficient integral care of them. The benefits coming from the multidisciplinary collaboration between pharmacists and physicians were investigated to define particular effects on patient’s health. Finally, we also draw attention to the need of overcoming some barriers that typically obstruct the drug therapy monitoring service.

MATERIALS AND METHODOLOGY

The study was carried out during a period of 3 years (November 2006 – December 2009) in a community pharmacy of Granada (Spain). The drug therapy monitoring service was offered to patients at the pharmacy: after a brief explanation about the characteristics and advantages of the service, any patient interested in it was automatically included. A protocol established a well-defined criterion of specific derivation of patients from drug dispensation to this service. It was not analyzed which was the profile of the patients that accepted the service, compared to ordinary patients. The pharmacists involved in the study were randomly chosen. Each supervision/monitoring of the pharmacotherapy was done considering all the requirements of any given medicine (necessity, efficacy, and safety). Medicine monitoring was carried out on the basis that independently of the type of drug used by the patients, there must be a concordance between the prescription and compliance with guidelines of drugs. Patient’s compliance of pharmacotherapy was continuously controlled by taking into account that the total number of dosages to be taken by the patients (as indicated in the prescription, and compared to pharmacotherapy guidelines) must fit

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with the real number of dosages that a patient was capable to take, as determined by analyzing the time between successive dispensions in the community pharmacy. The supervision of the drug therapy was possible thanks to at least three interviews with the patients per month. According to the current legislation, the patients signed a specific consent to include the data of the pharmacotherapy into the database of the community pharmacies.

The Dáder methodology [13, 23, 24] was followed to monitor the pharmacotherapy of the patients. This method describes the most appropriate procedures that must be followed in drug therapy monitoring, and all the documents needed to register this service. These documents can be classified into two categories: i) those used to register the interaction of the pharmacist with the patient (concise memory of the interviews (evolution of the diseases, new health problems, changes in the pharmacotherapy, etc.), results of the controls of blood pressure, body mass index (BMI), glucose blood levels, etc.); and, ii) those used to record the procedures (actions taken) that try to solve the DRPs (mainly, a detailed description of the pharmaceutical intervention, including the results obtained). Following the Dáder methodology, an initial study of the pharmacotherapy of each patient was carried out, considering the clinical history and, particularly, all the medicines under use. In this exhaustive analysis, any circumstance that could be a DRP was studied (in detail: non-compliance; drug interaction; unsuitable dose, guideline or length of the treatment; risk of drug side effect; erroneous administration of the medicine; contraindication; medicine duplication; inappropriate conservation; health problem insufficiently treated; error in the dispensation; error in the prescription; other health problem that affects the treatment; and, personal characteristics). In the next visit of the patient, the clinical manifestations of the DRPs were evaluated, and it was selected the most appropriate intervention to resolve each problem. At this moment, the community pharmacist also decided to work directly with the patient (communication pharmacist-patient) or, alternatively, in collaboration with the physician (communication pharmacist-patient-physician) to try to solve the DRPs. The type of interaction was chosen depending on the evaluation of the drug related problem. The interaction with the physician and the patient tried be done orally, but also involved the use of a letter of explanation. We were not always able to get access to the medical dossier (despite this is what ideally should have been done), a consequence of medical confidentiality. The interventions were further stratified in: i) minor (limited impact); ii) significant but not avoiding a major problem (useful); and, iii) significant and sparing to the patient a major problem (definite improvement of therapy by avoiding a serious non-desired effect). This method was also applied to future DRPs that could lead to NRM.

The instruments that could further emphasize the positive effects of the drug therapy monitoring service were the determination of the blood pressure, the BMI, and the glucose blood levels. Additionally, these determinations allowed confirming the efficacy of the pharmacotherapy. These measurements were done during each interview with the patients, and following widely accepted guidelines [12, 25-27]. In the case of the determination of the glucose blood levels, the patients were under fast and under rest during the previous 10 hours. Fresh blood sample was taken by capillary puncture, and the determinations were immediately done at room temperature following a methodology based on colorimetric reactions [CR2000 Multianalyst Photometer (Callegari, Italy), certified according to the EN60601-1-2 guidelines]. Additionaly, several activities of health education were planned for the patients, e.g., basic aspects of their chronic diseases, correct use of their medicines and, diet and hygiene recommendations.

Statistical analysis of the data was performed using Student’s t-test. Data with p < 0.05 and p < 0.001 were considered as significant and very significant, respectively.

RESULTS AND DISCUSSION

44 patients participated in the drug therapy monitoring service, 67 % were women, and 87 % of them were 60 years old or older. The average time of the pharmaceutical care service given to the patients per year was 470 min/patient (initial interview: 35 min, regular interviews: 350 min, and pharmaceutical interventions: 85 min). The average number of visits per patient and year was
41. 2319 suspicions of DRP were registered. 89 % of the DRPs induced a physiopathological manifestation as a consequence of a NRM (e.g., adverse drug effect, uncontrolled blood pressure or glucose blood levels, etc.). Taking into account the basic requirements of pharmacotherapy, the DRPs were related to necessity (32 %), efficacy (47 %), and safety (21 %). Table 1 shows the distribution of DRPs according to the classification proposed by the Pharmaceutical Care Forum [17, 23, 24].

Table 1. Incidence of DRPs in the group of patients.

<table>
<thead>
<tr>
<th>TYPE OF DRP</th>
<th>FREQUENCY (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-compliance</td>
<td>22</td>
</tr>
<tr>
<td>Drug interaction</td>
<td>15</td>
</tr>
<tr>
<td>Unsuitable dose, guideline or length of the treatment</td>
<td>14</td>
</tr>
<tr>
<td>Risk of drug side effect</td>
<td>12</td>
</tr>
<tr>
<td>Erroneous administration of the medicine</td>
<td>11</td>
</tr>
<tr>
<td>Contraindication</td>
<td>8</td>
</tr>
<tr>
<td>Medicine duplication</td>
<td>7</td>
</tr>
<tr>
<td>Inappropriate conservation</td>
<td>4</td>
</tr>
<tr>
<td>Health problem insufficiently treated</td>
<td>3</td>
</tr>
<tr>
<td>Error in the dispensation</td>
<td>2</td>
</tr>
<tr>
<td>Error in the prescription</td>
<td>2</td>
</tr>
</tbody>
</table>

A pharmaceutical intervention was needed to solve the DRPs in the 98 % of the cases. The number of medicines that were studied in these 1188 pharmaceutical interventions was 1900 (1.6 medicines/intervention): 31 % of the pharmaceutical interventions involved 2 medicines, 11 % involved 3 medicines, and the rest of the interventions involved only 1 medicine. Table 2 shows the drugs primarily involved in the DRPs.

Table 2. Frequency (%) of drugs primarily involved in the drug related problems grouped according to the anatomical therapeutic chemical (ATC) classification system [17, 28].

<table>
<thead>
<tr>
<th>THERAPEUTIC GROUP</th>
<th>FREQUENCY (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-hypertensives</td>
<td>21</td>
</tr>
<tr>
<td>Anti-diabetic drugs</td>
<td>17</td>
</tr>
<tr>
<td>Analgesics</td>
<td>16</td>
</tr>
<tr>
<td>Lipid-lowering drugs</td>
<td>13</td>
</tr>
<tr>
<td>Anti-bacterial drugs</td>
<td>11</td>
</tr>
<tr>
<td>Diuretics</td>
<td>10</td>
</tr>
<tr>
<td>Anti-thrombotics</td>
<td>7</td>
</tr>
<tr>
<td>Others</td>
<td>5</td>
</tr>
</tbody>
</table>

The interventions made to solve the DRPs were accepted, and resulted in a satisfactory result in the 82 % of the cases. As a consequence, the NRM's turned into very positive results associated to the medicines. Interestingly, the collaboration with the physician in the resolution of the DRPs offered significantly better results (figure 1). 26 % of the pharmaceutical interventions were done directly in collaboration with the patient (pharmacist-patient), and 72 % of them were accepted and had a positive resolution. The remaining (74 %) were done in cooperation with the physician (pharmacist-patient-physician), and the 91 % of them were accepted and had a positive result. Interestingly, the majority of the later interventions (46 %) supposed a significant improvement of therapy by avoiding a serious non-desired effect. 32 % were useful but not avoided a major problem, and 22 % were of minor (limited) impact. On the contrary, the majority of the pharmaceutical interventions done directly in collaboration with the patient were useful but not avoided a major problem (49 %), 32 % resulted in a significant improvement of therapy by avoiding a serious non-desired effect, and 19 % were of minor (limited) impact. The communication with both the patient and the physician was mainly carried out orally, but also involved the use of a letter of explanation (87 %).
Influence of the type of collaboration (Ph-P: Pharmacist-Patient, or Ph-P-Ph: Pharmacist-Patient-Physician) in the results of the pharmaceutical interventions that tried to resolve the DRPs (AI-SHP: Accepted Intervention-Solved Health Problem; NAI-SHP: Non-Accepted Intervention-Solved Health Problem; AI-NSHP: Accepted Intervention-Non-Solved Health Problem; NAI-NSHP: Non-Accepted Intervention-Non-Solved Health Problem). Comparatively to Ph-P-Ph/NAI-SHP, Ph-P-Ph/AI-NSHP, and Ph-P-Ph/NAI-NSHP, Ph-P-Ph/AI-SHP was statistically very significant (p < 0.001). Comparatively to Ph-P-Ph/NAI-SHP, Ph-P-Ph/AI-SHP was statistically significant (p < 0.05).

The collaboration with the physician was mainly chosen when the community pharmacist detected the following DRPs: drug interaction; risk of a drug side effect; medicine duplication; unsuitable dose, guideline or length of the treatment; error in the prescription; or, contraindication. Very interestingly, 84 % of the physicians accepted to collaborate with the community pharmacists. This is extremely important in drug therapy monitoring, as any intervention related to the diagnosis-prognosis-prescription sequence must be done in collaboration with the physician [13, 17, 22, 24]. Only when an erroneous administration, error in the dispensation, or when a bad conservation was detected, the community pharmacist directly worked with the patient. Finally, when it was identified a health problem insufficiently treated, the community pharmacist evaluated very carefully this DRP to decide the type of collaboration.

In order to further confirm the favourable effects of the drug therapy monitoring service on the health of the patients, our team also registered the evolution of the blood pressure, BMI, and glucose blood levels of the patients. For instance, patients with high blood pressure values experimented a very significant reduction in these values (average reduction in the systolic pressure ≈ 2.0 mmHg; average reduction in the diastolic pressure ≈ 1.5 mmHg), that was kept stable during the study. Similarly, the BMI and the glucose blood levels of the patients were significantly reduced to normal values. In detail, mean reduction in glyciosilated hemoglobin (HbA1c) was ≈ 5 % of total hemoglobin, and mean body weight los s was 6 Kg. Probably, this was due to the total compliance of the treatment by the patients. In this way, we must keep in mind that non-compliance with the drug therapy was the DRP of highest frequency (22 %, table 1). This result highlights the importance of the drug
therapy monitoring service to ensure that the patients follow the pharmacotherapy. It is especially important when patients cannot easily follow the evolution of diseases such as hypertension or diabetes (which symptoms are badly observed), before the appearance of serious complications. In these cases, the frequent determination of the blood pressure values, glucose blood levels, or BMI, will prove the benefits of the compliance of the pharmacotherapy on the control of the disease [17, 29].

The different activities of health education planned for the patients to enhance the knowledge about their diseases (sanitary education on health problems, e.g., risk factors, etc.), and their drug therapy (sanitary education on medicines, i.e., objectives and mechanism of action of drugs, importance of the drug therapy, benefits of the compliance of the pharmacotherapy, correct methodology of medicine administration, etc.) could have also contributed to the enhancement of the results of the drug therapy and, thereby, improve the quality of life for patients.

A fact that could limit the progression of the drug monitoring service is the low proportion of patients that were under pharmacotherapy monitoring, compared to the total number of people that usually comes to community pharmacies. This could be a consequence of [13, 17]: i) an insufficient motivation, and preparation of the community pharmacists; and, ii) the refusal of the patients to participate in this service, probably because of the fear of being under supervision/control in the use of medicines, the lack of motivation by the benefits of the service, or the opinion that the service is an act of intrusion with the physician. In order to try to minimize these problems, we improved the motivation, and formation (particularly in communication techniques) of the community pharmacists that were collaborating in the study. Finally, the significance of these very interesting results could have been greater if a control group was included (patients who eventually refused to participate to the study). However, the pharmacists did not have contact details of the people that refused to participate in the investigation and/or could be not present in the pharmacy when these patients went to obtain their medicines. On the opposite, a time-series approach could have been carried out. Unluckily, when we designed the investigation we were so excited by the potential benefits coming from the drug therapy monitoring service, that we missed this possibility.

CONCLUSIONS

The development of drug therapy monitoring services in community pharmacies can very importantly improve the results of the pharmacotherapy of the patients. The Dáder methodology helped very efficiently in the identification of drug related problems that could produce negative results associated to medicines. The pharmaceutical interventions done by the community pharmacists in collaboration with the physicians generated the best results in the resolution of the drug related problems, and significantly improved the pharmacotherapy and, as a consequence, the quality of life for patients. This multidisciplinary collaboration provided a global and complete health care to the patient.

ABBREVIATIONS

BMI - body mass index
DRPs - drug related problems
HbA1c - glycosilated hemoglobin
NRM - negative results associated to medicines

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DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.
REFERENCES


